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OBSERVATIONS ON *MEGANOLA SPODIA* FRANCLEMONT (LEPIDOPTERA: NOCTUIDAE) WITH A DESCRIPTION OF THE MATURE LARVA

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Abstract.—In 1985, Franclemont gave the name *Meganola spodia* to a species whose genitalia he had illustrated in 1960 but had left unnamed. The only mention of the larva of this species was in the 1960 paper in which a brief description of coloration was given along with the implication that Dyar's (1899) description of the *M. phylla* (= *minuscula*) larva was actually of *M. spodia*. *Meganola* larvae collected in West Virginia were reared to adults which are clearly *M. spodia*. The larvae are distinctly different from those previously described. Herein, I describe the last instar larva, cocoon construction and field observations for adults and larvae of *M. spodia*.

Key Words: Noctuidae (Nolinae), *Meganola spodia*, oak defoliation, larval description, West Virginia

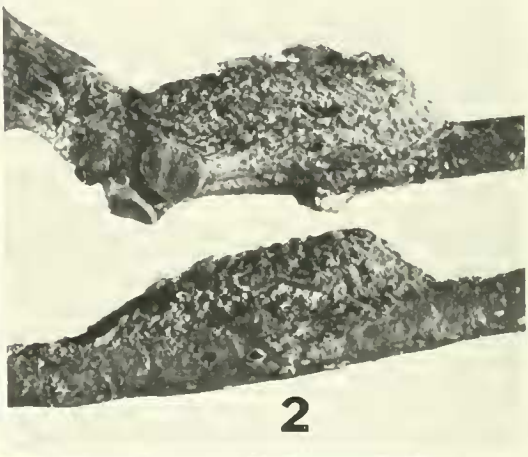
In 1983 during a study of an outbreak of spring defoliating geometrids, I collected partially mature larvae of an unknown Nolinae (Noctuidae) on oak in two eastern counties of West Virginia. Genitalia of adults reared from these larvae matched those illustrated for Franclemont's (1960) unnamed *Meganola*. Subsequently, this species was named *Meganola spodia* Franclemont (1985).

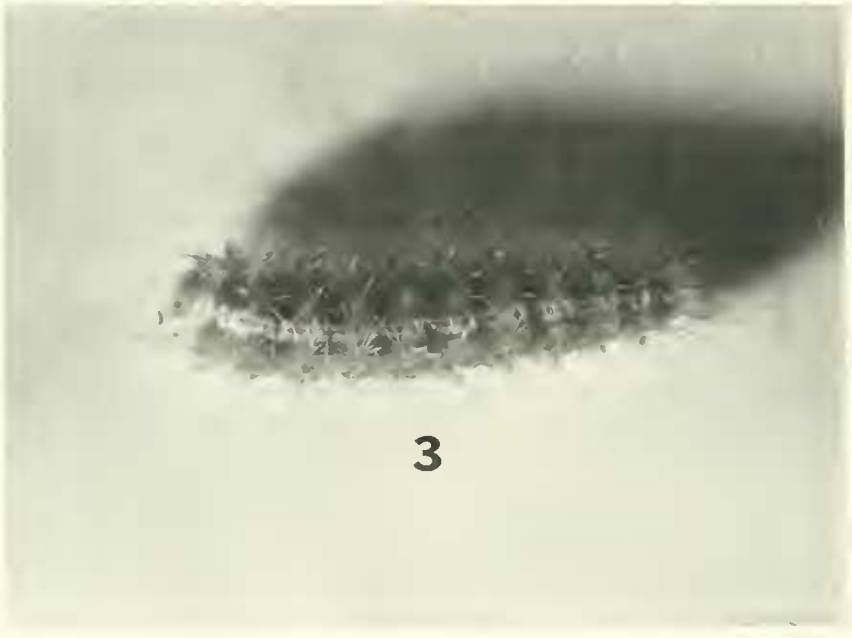
Franclemont (1960) included the following description of the larva of *M. spodia:* "dorsum pale cream color, mottled; with a dark brown subdorsal stripe, joined by transverse bands on A4 and 8; venter pale; hair pale, that on iii very long; head whitish, mottled with brown on the lobes, jaws black." Apparently, Franclemont believed Dyar's (1899) larval description of *M. phylla* Dyar (= *minuscula* Zell.) to be a description of *M. spodia*. Larvae which I reared in this study were a rich green in color; dorsal stripes were yellow and red; no transverse bands were present and longest body setae were dark brown. I do not consider Dyar's previous description of *M. phylla (miniscula)* to be that of *M. spodia*.

This paper includes field observations of larvae, a description of the last instar larva, cocoon construction and blacklight trap records for adults in West Virginia. Voucher specimens are in the West Virginia University Arthropod Collection, Morgantown.

BIOLOGICAL OBSERVATIONS

Meganola spodia larvae were collected at Cacapon State Park, Morgan Co., WV on chestnut oak (*Quercus prinus* L.) on 3 May 1983 soon after leaf expansion had begun. The larvae appeared to be about half mature and were yellowish to pale green with a yel-





Figs. 1–3. *Meganola spodia*. 1, larvae and damage on oak in field (1.3×). 2, cocoons (4.1×). 3, dorsal view of last instar larva (4.6×).

low mid-dorsal stripe. I collected additional larvae on the same host species at this location on 17 May. One larva was taken from this site 24 May on black oak (*Q. velutina* Lam.). Larvae were collected from post oak (*Q. stellata* Wang.) 13, 18, and 24 May on Elkhorn Mountain near Dorcas (Grant County) WV. A total of 20 larvae were collected.

Dyar (1892) described *Meganola* (as *Nola*) *minuscula* larvae as hiding "by day in dry curled leaves that adhere to the twigs or in some other place of concealment on the branch." The larvae I observed during this study (Fig. 1) fed diurnally and unconcealed which resulted in noticeable marginal and hole feeding damage on host foliage.

Field collected larvae were maintained in the laboratory on the host species on which they were collected. All larvae produced co-

coons by 29 May and adults emerged between 29 May and 18 June.

It appears as though *M. spodia* produces one generation per year and overwinters as half mature larvae.

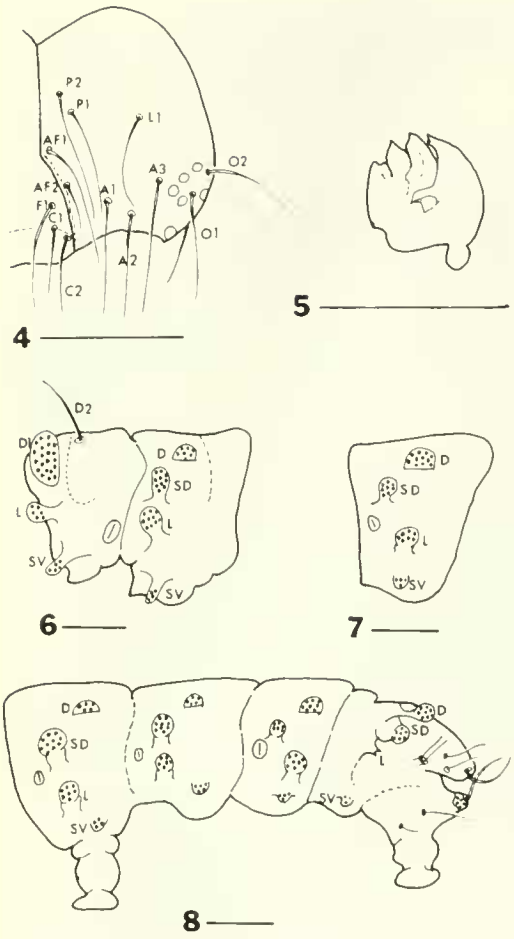
M. spodia adults have been recorded from New Jersey, New York, Virginia, North Carolina and Kentucky with collection dates ranging from 18 June to 16 July (Franclemont 1985). West Virginia records of adults at blacklight traps are as follows: Boone Co. (Danville) 15 June 1979, R. Swope; Fayette Co. (Babcock State Park) 11 July 1979, L. Butler; Grant Co. (Dorcas-Elkhorn) 7 July 1980, L. Butler; Lincoln Co. (Big Ugly Public Hunting Area) 28 June 1979, L. Butler; McDowell Co. (Panther State Forest) 23 June 1979, L. Butler; Monongalia Co. (Triune) 14 July 1979, L. Butler; Morgan Co. (Cacapon State Park) 17 July 1979; and Wyoming Co. (Twin Falls State Park) 3 July 1980, L. Butler. Seventeen adults from blacklight traps are in the West Virginia University Arthropod Collection.

Cocoon Construction

Stehr (1987) described Nolidae cocoons as being well formed, boat shaped with an anterior ridge forming a valve-like slit. Packard (1884) described *Nola ovilla* Grt. cocoons as boat shaped, oval, and cylindrical attached to leaves and spun with silk and bits of leaves. Additional observations on *N. ovilla* (as *Lebena ovilla*) were "the larva builds up two parallel walls and unites them at the top. Cocoon elliptical, flat at base, size 7 × 2½ mm. The anterior end is a little higher and more pointed than the posterior" (Dyar 1894). *N. triquetrana* (Fitch) (as *N. sexmaculata* Grt. and *N. trinotata* Walker) constructs the cocoon on a piece of wood from bits of bark laid together like bricks (Dyar 1890, 1891). The cocoon of *Nola minna* Butler (as *Nola hyemalis* Stretch) was described as "not strong, composed entirely of silk, and not firmly fastened to a support. It is elliptical, opaque white" (Dyar 1891). *Meganola minuscula* (Zeller) (as *N. phylla* Dyar) cocoons were described as triangular and constructed of little pieces of bark (Dyar 1899). The cocoon of *M. minuscula* (as *Nola minuscula* Zeller) was described as "elliptical, opaque, sordid white, composed of white silk, quite tough and intermingled sparsely with larval hairs. Dimensions 8 × 4 mm" (Dyar 1892).

Cocoon construction by *M. spodia* larvae is detailed. The larva lies along the twig facing what will ultimately be the front of the cocoon and lays down a thin silk mat on the twig, lies over the mat and begins plucking small bits of twig bark (thin transparent cortex flakes and darker, bark chunks), and incorporating them into the silk, working alternately on left and right sides of the twig, thus producing flanges on each side of the twig. The larva stretches forward to pluck bark from in front of the mat and curls its body into a "C" over the edge of the mat to pluck bark from the bottom of the twig below the mat. Larvae stretch farther on smaller diameter twigs to reach enough construction material.

When the sides of the mat are each about 4 mm wide; the larva backs up, plucks bark from the twig above the mat, and applies silk and bark to produce cupping of the two sides. When each side of the mat reaches about 5 mm wide, the larva completes the front of each side by adding anteriorly extending points where each side of the mat attaches to the twig and at their outermost edges to produce flaps. The left flap is extended about 1.5 mm beyond the right. Just prior to closure, the larva begins inverting its body, alternately examining each end of the cocoon and adding bark or silk to weak spots. Closure begins at the back of the cocoon at twig level as the larva pulls the two sides together, connects them with silk and continues to close the top of the cocoon from posterior to anterior. For front closure, the larva generally adds silk to the left flap, grasps the flap with the mandibles, pulls it toward the right flap and attaches it; flap



Figs. 4–8. *Meganola spodia*. 4, head capsule, frontal view. 5, left mandible, oral surface. 6, prothorax and mesothorax, lateral view. 7, abdominal segment 1, lateral view. 8, abdominal segments 6–10, lateral view. Figs. 6–8 anterior to left. Scale lines = 0.5 mm.

closure generally progresses from bottom to top.

While cocoons were generally constructed of silk and twig bark, one larva which produced a cocoon on post oak incorporated oak bud scales into the cocoon. One cocoon on a leaf petiole consisted of petiole epidermis and leaf pubescence held together with silk.

The average cocoon construction time for those which I timed was 7 h, 42 min (range 6 h, 40 min to 8 h, 50 min).

Cocoons (n = 15) averaged 12.7 mm in length (range 11.8–13.2 mm), 3.54 mm in height (range 3.2–4.0 mm) and were produced on twigs which averaged 2.5 mm in diameter (range 1.8–3.2) (Fig. 2).

Description of Last Instar Larva

Live last instar larvae medium green; "knobs" of verrucae reddish; narrow red dorsal stripe, continuous between segments and slightly widened at middle of each segment, bordered by yellow stripes edged laterally in red (Fig. 3).

The length of five mature ethanol preserved larvae ranged from 14.0 to 17.5 mm.

Head (Fig. 4): Pale tan with darker yellow-tan freckles. Greatest head width 1.78 mm. Adfrons weakly defined; frontoclypeus slightly less than one-half the distance to epicranial notch. Stemmata 1–4 evenly spaced; 6 close to 4; 5 at posterolateral edge of antennal socket. All head setae long and fine. P2 and P1 closely adjacent with P2 above and closer to epicranial suture. L1 distant from and slightly below P1 and directly above A2, which is slightly below A1; A3 slightly above stemma 3, O2 near lower edge of stemma 1 and O1 slightly above stemma 4. AF1 at junction of frontal and coronal sutures and directly above F1. C1 and C2 closely adjacent and at membranous fronto-clypeal junction. Mandibles (Fig. 5) with four outer teeth; strong tooth on inner surface; two well-separated outer setae present.

Thorax (Fig. 6): Ventral gland absent. Most primary setae obscured by tufts of irregularly lengthened secondary setae on verrucae. T1 shield weakly developed. D1 verrucae low, lying along anterior edge of T1, expanded transversely and almost meeting at dorsal midline; all setae brown tipped. D2 setae large, prominent, closely adjacent at midline. L verruca slightly knobbed, protuberant; setae of irregular lengths, longest uniformly brown, intermediate ones all pale and shortest setae brown tipped. SV verruca very protuberant, all setae pale. T1 spiracle elliptical, yellow-

ish brown with darker brown peritremes; T1 spiracle 2× size of those of A1–A7.

On T2, D1 verruca low, rounded; setae of irregular lengths, none very long, most brown tipped. SD and L verrucae very fleshy, protuberant, slightly knobbed; two long, brown whip like setae on SD verruca, other setae shorter and entirely brown or brown tipped; one long, brown whip like seta on L verruca, other setae in decreasing lengths all pale, all brown, and brown tipped. SV verruca small, but very protuberant; setae irregular, all pale. T3 setal arrangement similar to that of T2, but SD and L setae not large and whip like.

Abdomen (Figs. 7, 8): On A1-8 all D verrucae low, rounded, all SD and L large, protuberant and slightly knobbed. L setae very irregular in length, most longer setae pale. One brown whip like seta on L verruca of A8. SV verrucae small, sparsely haired, all setae pale. A8 spiracle 2× the size of spiracles on A1–A7. On A9 (Fig. 8), D and SD well developed, fleshy, protuberant, each with two prominent, brown, whip like setae. L verruca smaller with one prominent brown seta. SV greatly reduced, sparsely haired. A10 (Fig. 8) with most setae primary. Most prominent feature is anal fork formed by four long, stout intererossing setae. Crochets all uniordinal mesoseries; A4 and A5 with 21-22 crochets, A6 with 20–21 and A10 with 22–23.

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